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(54) Abstract Title  
Displaying text messages on a portable TV phone

(57) A mobile phone includes an integral television. When the phone is in TV mode and an incoming text message is detected 102, the first line of the message is displayed on screen 104, 106, 108 and other lines may be scrolled onto the screen using up/down scroll keys 112, 114. An on screen display (OSD) unit receives 102 the text message from a base station and produces a character generating control signal 106 suitable for displaying the text on the TV screen. The outputs of the OSD and TV receiver are selected via a multiplexer 110.

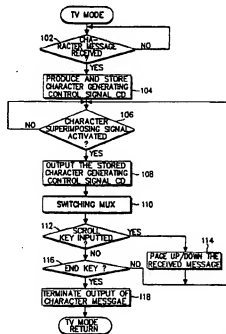


FIG. 2

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

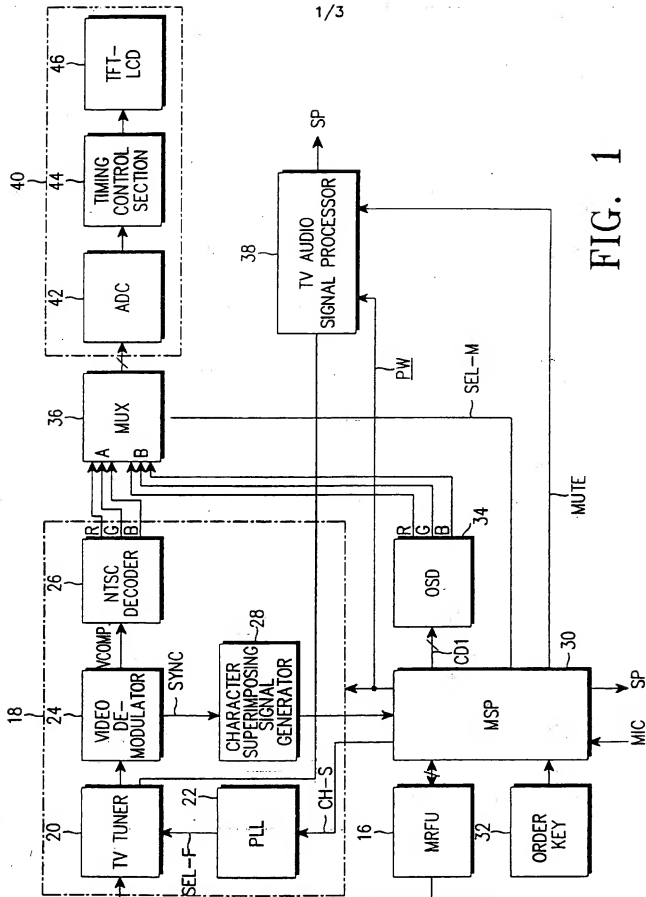


FIG. 1

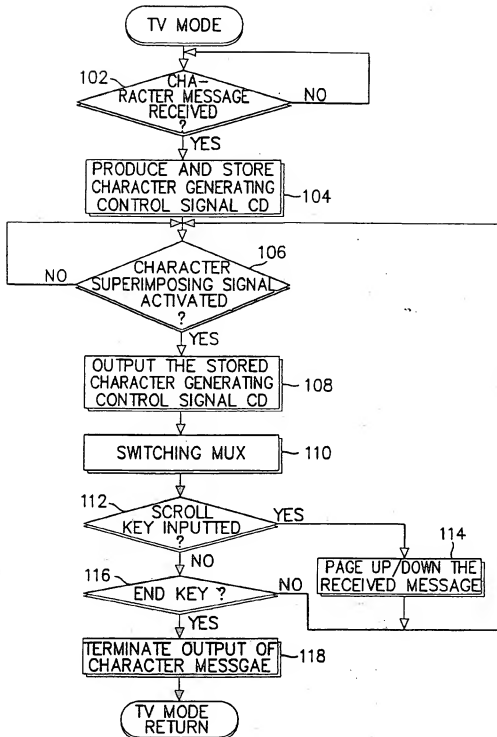


FIG. 2

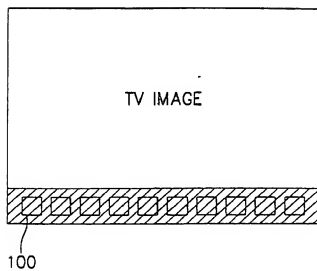


FIG. 3A

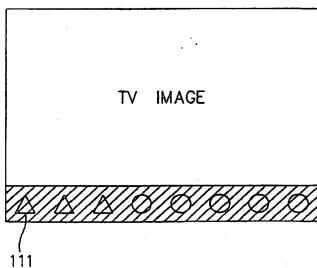


FIG. 3B

## PORTABLE TELEVISION (TV) PHONE

The present invention relates to an apparatus and a method for controlling operation of a hand-held portable cellular telephone, and more particularly to a method for displaying a character message received from an integrally combined television (TV) and portable cellular phone (hereinafter, referred to as "TV phone") in a scrolling manner on a viewing screen thereof.

In recent years, rapid and wide spread use of a portable telephone as an ordinary personal communication appliance in society has driven the desire of users toward development of the portable phone with a variety of additional functions besides a simple conversation function. For example, such a portable phone has been developed to have a calculating function, a biorhythm checking function, and other functions capable of transmitting/receiving images of a TV and a video camera additionally included therein. The term "TV phone" herein refers to wireless portable cellular phones of all types which allow for watching a television (TV) broadcast program through a displaying unit of the portable phone in addition to a cordless telephone conversation function for telecommunication.

An example of the above TV phone is disclosed in Korean patent application no. 1995-46026 entitled "A

*Combined TV Receiver and Cellular Phone*" by LG Electronics Co., Ltd earlier filed in the Korean Industrial Property Office on December 1, 1995 and published on July 31, 1997 by that Office.

5           For the above reception function for a TV broadcast, the portable phone should be equipped with two radio frequency units therein since as disclosed in the above prior art. The reason for this is that the frequency bandwidth necessary for transmitting/receiving inherent  
10   messages (i.e., voice and data) is different to that required for reception of a TV broadcast. The operational modes can be classified into a phone mode, a waiting mode, and a TV mode also used as the waiting mode. Since the TV phone should allow a user to watch and hear images and  
15   voices of the television broadcast program received in the TV mode through a display unit, i.e. a Thin Film Transistor (TFT) Liquid Crystal Display (LCD), and a speaker or an earphone of the portable phone, it should be distinguished from a general portable phone by allowing a  
20   user to be informed of an incoming call and an incoming character message while in the TV mode state.

          However, the TV phone in the above prior art mode can just control the cellular transmitter/receiver and TV  
25   receiver respectively by using only one microprocessor but not process character messages such as SMS (short message service) and so on. Further, it is not possible to switch

from the TV mode to the phone mode when an incoming call is received during the TV mode. Accordingly, the energy consumption of the battery is increased and it is very inconvenient for a user to switch from the TV mode to the phone mode, namely the user has to turn off the TV mode and then switch from the TV mode to the phone mode in person for every incoming call.

There is no method of immediately informing the user of the occurrence of an incoming call and an incoming character data message when the incoming call and/or the incoming character data message occurs simultaneously with received images and voices in the TV mode are being output.

It is an object of the present invention to at least mitigate some of the problems of the prior art.

Accordingly, a first aspect of the present invention provides a method of displaying a text message on a TV phone which includes a TV unit for reproducing and outputting a first video signal from a selected channel, a display unit connected to the TV unit for displaying an input video signal, an OSD unit for generating a second video signal corresponding to the input of a display control signal and providing the generated signal to the display unit, a MRFU for receiving data of a forward channel transmitted from a base station, a MSP for

providing channel selection signal to the TV unit in response to the TV mode transmitting/receiving a voice signal by controlling the MRFU in response to the phone mode and generating a display control signal responsive to an incoming call, the method comprising the steps of:

receiving a character message transmitted from the base station through the forward channel when the video signal and the audio signal regenerated from the TV unit are reproduced and output to the outside of the TV phone through the display unit and the TV audio signal processor; and

displaying a video signal of the OSD corresponding to the first line in the received character message on a screen of the display unit.

An embodiment of the present invention provides a method further comprising the step of paging-up or paging-down the received character message in response to input of an up-scroll or a down-scroll command generated from an up-scroll key or a down-scroll key arranged on a key pad to display an up-page or a down-page to the previous or next line of a received character message.

A further embodiment of the present invention provides a method further comprising the step of clearing the character message displayed on the screen of the display unit to display only present images of the TV program on the air, in response to input of an output



terminating signal of the received character message.

In accordance with one embodiment of the present invention, there is provided a method for displaying a message received upon the viewing a TV program in a TV mode of a TV phone including a TV unit for regenerating a video signal and an audio signal from a selected channel, a TV audio signal processor for processing the regenerated audio signal to output it as an audible sound, a display unit for displaying the audio signal input, an ON-screen display, (hereinafter, referred to as "OSD"), for generating images character and graphic images corresponding to an input of a control signal for generating characters, a multiplexer for selecting one of the output signals of the OSD and the regenerated video signal for application to the display unit, a Mobile Radio Frequency Unit, (hereinafter, referred to as "MRFU"), for receiving data of a forward channel transmitted from a base station, a Mobile Station Processor, (hereinafter, referred to as "MSP"), having a TV mode and a phone mode, for supplying the TV unit with a channel selecting signal in the TV mode while supplying the multiplexer with a control signal to control the output of the video signal.

Advantageously, embodiments of the present invention allow the realisation at least one of a TV phone that more rapidly and accurately informs a user that the incoming of both a call and a character data message has occurred when

viewing any TV broadcast program in a TV mode; a method for more efficiently communicating a character message received upon the viewing of any TV program in a TV mode of a TV phone to a user without interfering with a user's viewing of the TV program; and a method for displaying, in a scrolling manner on a viewing screen of a display unit, a character message received upon the viewing of any TV program in a TV mode.

The method of an embodiment comprises the steps of:

receiving a character message transmitted from the base station through the forward channel when the video signal and the audio signal regenerated from the TV unit are reproduced and output from the TV phone through the display unit and the TV audio signal processor;

displaying some of the received character message on a screen of the display unit during an interval in which a character superimposing signal is generated.

A second aspect of the present invention provides an apparatus for displaying a text message on a TV phone which includes a TV unit for reproducing and outputting a video signal from a selected channel, a display unit connected to the TV unit for displaying an input video signal, an OSD unit for generating a video signal corresponding to the input of a display control signal and providing the generated signal to the display unit, a MRFU for receiving data of a forward channel transmitted from a

base station, a MSP for providing channel selection signal to the TV unit in response to the TV mode transmitting/receiving a voice signal by controlling the MRFU in response to the phone mode and generating a display control signal responsive to an incoming call, the apparatus comprising: means for receiving a character message transmitted from the base station through the forward channel when the video signal generated from the TV unit is displayed on the display unit; and means for displaying a video signal of the OSD corresponding to the first line in the received character message on a screen of the display unit..

An embodiment provides an apparatus further comprising means for paging-up or paging-down the received character message in response to input of an up-scroll or a down-scroll command generated from an up-scroll key or a down-scroll key arranged on a key pad to display an up-page or a down-page to the previous or next line of a received character message.

A further embodiment of the present invention provides an apparatus further comprising means for clearing the character message displayed on the screen of the display unit to display only present images of the TV program on the air, in response to input of an output terminating signal of the received character message.

Embodiments of the present invention will now be described by way of example only with reference to the accompanying drawings in which:

figure 1 is a block diagram illustrating the construction of a TV phone according to a preferred embodiment of the present invention;

figure 2 is a flowchart illustrating the displaying process of the received character message of the TV phone according to a preferred embodiment of the present invention; and

figures 3a and 3b are schematic views illustrating a state in which the received character message is displayed on a screen of a display unit of the TV phone according to a preferred embodiment of the present invention.

Reference will now be made in greater detail to the preferred embodiments of the present invention. In the following description of the present invention, only portions necessary for understanding the operation of the present invention are set forth, and a detailed description of known functions and configurations incorporated herein will be omitted when it may make the subject matter of the present invention rather unclear.

Figure 1 is a block diagram illustrating the construction of a TV phone according to a preferred embodiment of the present invention. In figure 1, reference numeral 16 designates an MRFU, a reference

numeral 30 designates an MSP, and reference numeral 32 designates a key pad of a portable phone module, respectively. Such circuits are configured in such a manner that the constructions for implementing the present invention are added to circuits applied to a conventional portable digital cellular phone, e.g., CDMA type portable cellular phone, and this construction and operation will be apparently understood by reference to the following detailed description.

Also, reference numeral 18 designates a TV unit, reference numeral 34 designates an OSD, reference numeral 36 designates a multiplexer, (hereinafter, referred to as "MUX"), reference numeral 38 designates a TV audio signal processor, and reference numeral 40 designates a display unit, respectively. The TV unit 18 and the TV audio signal processor 38 are TV modules.

Now, the operation of the TV phone according to an embodiment of the present invention will be described in detail hereinafter with reference to figure 1.

First of all, assume that the operational mode of the TV phone is set to a TV mode. An alarm mode of an incoming call of the TV phone as shown in figure 1 is mainly divided into three alarm modes to inform a user of the incoming of a call. For example, any one call incoming mode may be received with the portable TV being

in one of three incoming call modes including a first incoming call mode for "on/off" switching audio sound of the TV phone, a second incoming call mode for muting the audio sound of the TV phone and "on/off" switching output of an image of the TV phone, and a third incoming call mode for displaying a call incoming message at a specific region on a TV image displaying screen.

A radio-frequency, electromagnetic signal is received by an antenna 12 which converts the radio-frequency, electromagnetic signal into an electrical signal which is supplied to a radio frequency filter, i.e., a bandpass filter 14. The bandpass filter 14 is operative to pass only frequency components of a frequency bandwidth for a TV broadcast. The bandpass filter 14 generates filtered signals that are applied to the TV unit 18.

When the operational mode of the TV phone is set to a TV mode, the MSP 30 supplies a power control signal PW for the TV unit 18 and the TV audio signal processor 38 to operate the TV unit 18 and the TV audio signal processor 38. The MSP 30 supplies a phase locked loop 20, (hereinafter, referred to as "PLL"), in the TV unit 18 with a channel selecting signal input from the key pad 32 or a channel selecting signal CH-S for selecting a previous viewing channel. Then, PLL 20 locks onto or generates a tuning frequency SEL-F corresponding to the

channel selecting signal for application to a TV tuner 20. The TV tuner 20 combines the filtered signal input thereto from the bandpass filter 14 and the tuning frequency SEL-F from the PLL 20 to output the resultant down-converted  
5 video intermediate frequency (VIF) signal and audio intermediate frequency (AIF) signal.

A video demodulator 24 coupled to the output terminal of the TV tuner 20 demodulates the video intermediate frequency (VIF) signal to apply the resultant  
10 composite video signal Vcomp to an NTSC decoder, (video decoder), 26 while applying a synchronising signal SYNC of the composite video signal to a character superimposing signal generator 28. The NTSC decoder 26 decodes the composite video signal Vcomp to apply the decoded  
15 composite video signal as a color signal of R, G, B to a terminal A of the MUX 36.

The character superimposing signal generator 28 counts the synchronising signal SYNC, and generates a character superimposing signal if the counted signal value  
20 is a predetermined value. That is, the character superimposing signal generator 28 comprises a counter for counting a horizontal synchronizing signal, a memory for storing a position value of a horizontal line, and a comparator for comparing the counted signal value from the  
25 counter and the output value from the memory and generating a character superimposing control signal

activated during a retrace period of the horizontal synchronizing signal if the counted signal value from the counter is equal to the output value from the memory, and generates a character superimposing control signal of a regular interval in every field or frame period.

Accordingly, the TV unit as constructed above, is operated by activation of the power control signal from the MSP 30, and generates a video signal and an audio signal of a TV broadcast channel according to the channel selecting signal while generating an interval control signal for superimposing an incoming character message on a screen of the display unit 40 when an incoming of a call occurs. The generation of such a character superimposing control signal will be advantageously used when an incoming alarm mode is a text mode of a third incoming mode.

Meanwhile, the MUX 36 is adapted to select the video signals R, G, and B input thereto from the NTSC decoder by a video selecting signal SEL-M output at a "low" state from the MSP 30 for application to an analog-to-digital converter (ADC) 42 of the display unit 40. The ADC 42 converts the selected video signals R, G, and B into digital signals that are applied to a timing control section 44. The timing control section 44, which includes a synchronizing signal generator for generating a pseudo-vertical synchronizing signal and a pseudo-vertical



synchronizing signal, drives a TFT-LCD 46 by the video data signals input thereto from the ADC 42 to allow any image to be displayed on a screen thereof. In addition, the TV audio signal processor 38 operated by the power control signal PW output from the MSP 30 processes the audio intermediate frequency (AIF) signal input thereto from the TV tuner 20 to reproduce an audio signal for a TV program and output the reproduced audio signal through a transducer such as a speaker.

Accordingly, it can be seen that the TV unit 18, the TV audio signal processor 38, and the display unit 40 as shown in figure 1 receive and reproduce a video signal and an audio signal for a TV program for a channel selection by the control of a TV mode of the MSP 30. During this operation, when a user manipulates a channel selection key arranged on the key pad 32 to select a desired channel, the MSP 30 changes the channel selecting signal CH-S so that the tuning frequency and the output of the PLL 22 are also changed, which in turn changes a channel of the TV tuner.

Meanwhile, the MRFU 16 coupled to the antenna 12 receives a radio-frequency, electromagnetic signal of a transmitting/receiving frequency bandwidth for a portable phone, converts an analog signal into a digital signal or converts a digital signal into an analog signal, and power-amplifies the converted signal to transmit it

through the antenna 12. The MRFU 32 can be easily constructed by combining an RF unit and a baseband analogue circuit of a conventional portable phone. For example, the MRFU 32 can be constructed by combining a CDMA type radio transceiver unit and a chip of "BBA2.X(Q5312CDMA)" manufactured by "QUALCOMM. Co." as a BBA circuit for converting an analog signal into a CDMA type digital data and vice versa, and an RF unit.

The MSP 30 coupled to the MRFU 16 analyses commands supplied from the key pad 32 and generates control signals corresponding to the commands. Further, the MSP 30 has a variety of functions such as analysis of a received forward channel data message, reproduction of an analog audio signal from the received data, extraction of a character data from the received data and corresponding reverse functions by demodulating, de-interleaving, decoding, data signal processing, and vocoding of the digital signal input thereto from the MRFU 16. For example, the MSP 30 also has functions that output the reproduced analog audio signal through a speaker, and convert an analog audio signal input thereto from a microphone (MIC) into a CDMA type digital signal to allow the converted digital signal to be transmitted to as a reverse channel through the MRFU 16. In addition, the MSP 30 informs a user watching a TV program of reception of a character message by a character message displaying routine set in an inner memory if the received forward

channel data message is a character message. The MSP 30 may be used as "MSM2300" of a one-chip type supplied from "QUALCOM co." in U.S.A.

5 The OSD coupled to an output of the MSP 30 generates an OSD video signal corresponding to a character generating control data output from the MSP 30 for application to another input terminal of the MUX 36. In a TV mode, The MUX 36 selects the video signals R, G, and B input to the input terminal A thereof by the video  
10 selecting signal SEL-M output at a "low" state from the MSP 30 for application to an analog-to-digital converter (ADC) 42 of the display unit 40.

Figure 2 is a flowchart illustrating the displaying process of the received character message of the TV phone according to a preferred embodiment of the present  
15 invention, in which the operational mode of the TV phone of figure 1 is switched from a TV mode to a phone mode upon the reception of an incoming call message, or is maintained in the TV mode. A program for the flowchart is  
20 masked in a memory block of the MSP 30 in shown in figure 1.

Referring now to figure 2, in a state in which a user watches the TV program of a desired channel of the TV phone in a TV mode, the MSP 30 monitors an output of the  
25 MRFU 16 and determines whether or not any character

message has been received at step 102. If it is determined at step 102 that any character message has not been received, the MSP 30 continues to operate in the TV mode. The term "character message" means a character message of SMS (short message service) presently provided by a portable phone.

On the other hand, if it is determined at step 102 that the MRFU 32 has received any character message, the program proceeds to step 104 at which the MSP 30 decodes the received character message to produce a character generating control signal CD and stores the character generating control signal CD in a memory inside thereof. Subsequently, the program proceeds to step 106 at which it is determined whether or not a character superimposing signal output from the character superimposing signal generator 28 is activated. The term "character superimposing signal" means a region at the bottom portion of a field or a frame as described above, i.e., an oblique line portion.

If it is determined at step 106 that the character superimposing signal output from the character superimposing signal generator 28 is activated, the program proceeds to step 108 where the MSP 30 supplies the character generating control signal CD stored in the memory thereof for the OSC 34. At subsequent step 118, the MSP 30 generates the video selecting signal SEL-M in a

logic "high" state to switch the output of the MUX 42.

At this time, the OSD 34 generates a character video signal corresponding to the character generating control signal CD output from the MSP 30 for application to the  
5 MUX 36 which outputs the character video signal output from the OSC 34 in response to the video selecting signal SEL-M in a logic "high" state to the display unit 40 to allow the received message to be displayed at the bottom portion i.e., a character displaying region, of the TV  
10 image as shown in figure 3a.

Meanwhile, at next step 112, the MSP 30 determines whether or not a scroll key arranged on the key pad 32 is selected. The term "a scroll key" means both a down scroll key allowing for the reading again a previous  
15 character message and an up scroll key allowing for displaying a following character message of the received message. If the scroll key is determined to be selected at step 112, the MSP 30 pages-up or pages-down the received character message and the program goes back to the previous step 106 where the above mentioned process  
20 following the step 106 is conducted repeatedly. The term "pages-up or pages-down" means upward or downward movement of the received message displayed at the character displaying region on a screen of a TFT-LCD 46 of the display unit 40 in response to input of an up-scroll  
25 selecting signal or a down-scroll selecting signal.

generated from the up-scroll key or the down-scroll key by manipulation of the scroll key as shown in figures 3a and 3b. Thus, in the case that a length of the received character message is long, a user can read the received character message by displaying it in a scrolling manner, at the bottom portion, i.e., the character displaying region of a screen of a TFT-LCD 46.

If, on the other hand, the scroll key is determined to not be selected at step 112, the program proceeds to step 116 at which the MSP 30 determines whether or not an end key is selected by checking an output signal of the key pad 32. If it is determined at step 116 that the end key is not selected, the program goes back to step 106 where the above mentioned process following the step 106 is conducted repeatedly in order to continue to display the character message displayed at the character displaying region on the screen of the TFT-LCD 46 as shown in figures 3a and 3b. At step 116, if it is determined that after reading entirely the character message displayed at the character displaying region on the screen as shown in figures 3a and 3b, a user selects the end key, the program proceeds to step 118 at which the MSP 30 still supplies the MUX 36 with the video selection signal SEL-M of a logic "low" state to allow only a TV image output from the NTSC decoder 26 to be displayed on the screen of the TFT-LCD 46 of the display unit 40 so that the received character message is no longer displayed at the character

displaying region on the screen in figures 3a and 3b.

While the description in the above embodiment is made in relation to the TV unit for output the RGB video signal, the display unit for converting the analogue video signal to the digital video signal and then displaying the converted signal, and the multiplexer for transmitting the TV video signal and the video signal of the OSD to the display unit selectively, the above structural elements can be replaced with other elements having the same functions by a person skilled in the art.

For instance, it is possible to make the TV unit to output an analogue complex video signal and a complex synchronising signals and to construct the display unit with an LCD drive and TFT-LCD for displaying an image using the complex video signal and the complex synchronising signal. In the case of displaying an image on the TV using the complex video signal and the complex synchronising signal, the image of the OSD can be displayed using the video memory (video memory or video ROM) and the timing generator for the complex video signal. As a result, the switching operation in the multiplexer is not necessary and the time for displaying the image of the OSD can be reduced.

Further, in the case of using the video memory and video memory controller as described in the above, the

image of the OSD can be displayed at a desired position on the display unit without the character superimposing signal generator as shown in figure 1. In the case of controlling the display of the OSD as described in the above, the character of the OSD can be displayed without regard to the activation of the image superimposing signal.

As apparent from the above description, the TV phone of the present invention provides an advantage in that the case of a character message being received when a user watches any TV program in a TV mode, the received character message can be automatically displayed, in a scrolling manner, at the bottom portion, i.e., the character displaying region of a TFT-LCD screen of the TV phone, thereby allowing for free transmission/reception of any character message without interfering with a user's viewing of a TV program being interfered and with the necessity of switching of the TV mode to a phone mode being obviated.

While this invention has been described in connection with what is presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not limited to the disclosed embodiment, but, on the contrary, it is intended to cover various modifications within the spirit and scope of the appended claims.



Furthermore, although the invention has been described with reference to an NTSC format television signal or a CDMA communication system, it will be appreciated that PAL or some other television signal, such as D2-MAC, or a GSM communication system could equally well be used.

## CLAIMS

1. A method of displaying a text message on a TV phone which includes a TV unit for reproducing and outputting a video signal from a selected channel, a display unit connected to the TV unit for displaying an input video signal, an OSD unit for generating a video signal corresponding to the input of a display control signal and providing the generated signal to the display unit, a MRFU for receiving data of a forward channel transmitted from a base station, a MSP for providing channel selection signal to the TV unit in response to the TV mode transmitting/receiving a voice signal by controlling the MRFU in response to the phone mode and generating a display control signal responsive to an incoming call, the method comprising the steps of:

receiving a character message transmitted from the base station through the forward channel when the video signal and the audio signal regenerated from the TV unit are reproduced and output to the outside of the TV phone through the display unit and the TV audio signal processor; and

displaying a video signal of the OSD corresponding to the first line in the received character message on a screen of the display unit.

2. A method as claimed in claim 1, further comprising

the step of paging-up or paging-down the received character message in response to input of an up-scroll or a down-scroll command generated from an up-scroll key or a down-scroll key arranged on a key pad to display an up-page or a down-page to the previous or next line of a received character message.

3. A method as claimed in either of claims 1 or 2, further comprising the step of clearing the character message displayed on the screen of the display unit to display only present images of the TV program on the air, in response to input of an output terminating signal of the received character message.

4. A method for displaying a text message on a portable TV phone substantially as described herein with reference to and/or as illustrated in the accompanying drawings.

5. Apparatus for displaying a text message on a TV phone which includes a TV unit for reproducing and outputting a video signal from a selected channel, a display unit connected to the TV unit for displaying an input video signal, an OSD unit for generating a video signal corresponding to the input of a display control signal and providing the generated signal to

the display unit, a MRFU for receiving data of a forward channel transmitted from a base station, a MSP for providing channel selection signal to the TV unit in response to the TV mode transmitting/receiving a voice signal by controlling the MRFU in response to the phone mode and generating a display control signal responsive to an incoming call, the apparatus comprising: means for receiving a character message transmitted from the base station through the forward channel when the video signal generated from the TV unit is displayed on the display unit; and means for displaying a video signal of the OSD corresponding to the first line in the received character message on a screen of the display unit.

6. An apparatus as claimed in claim 5, further comprising means for paging-up or paging-down the received character message in response to input of an up-scroll or a down-scroll command generated from an up-scroll key or a down-scroll key arranged on a key pad to display an up-page or a down-page to the previous or next line of a received character message.

7. An apparatus as claimed in either of claims 5 or 6, further comprising means for clearing the character message displayed on the screen of the display unit

to display only present images of the TV program on the air, in response to input of an output terminating signal of the received character message.

5

8. An apparatus for displaying a text message on a portable TV phone substantially as described herein with reference to and/or as illustrated in the accompanying drawings.



Application No: GB 9930478.4  
Claims searched: 1 to 3, 5 to 7

Examiner: Jared Stokes  
Date of search: 29 June 2000

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): H4K (KBHC, KFH)  
H4L (LESF, LERA)

Int Cl (Ed.7): H04M (1/725, 11/08)  
H04N (5/445)  
H04Q (7/22, 7/32)

Other: On-Line - EPODOC, JAPIO, WPI

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
A	WO 98/56197 A1 (Telia) See abstract	-
A	US 5 937 329 (Helmy et al.) See abstract	-

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.